

Design Documentation Guidelines

Electrical Services

Concept Design Phase

Design Process	Deliverables	Commentary
Inputs: <ul style="list-style-type: none"> Client brief and budget. <input type="checkbox"/> Architectural sketch concept. <input type="checkbox"/> Project time schedule. <input type="checkbox"/> Preliminary fire safety report. <input type="checkbox"/> Site survey information. <input type="checkbox"/> Site and environmental condition constraints. <input type="checkbox"/> Project delivery methodology. <input type="checkbox"/> Design: <ul style="list-style-type: none"> Review of client requirements including reliability, redundancy and efficiency. <input type="checkbox"/> Establish design criteria and develop functional services brief. <input type="checkbox"/> Investigate interface requirements with existing buildings and equipment. <input type="checkbox"/> Establish hazardous area classification if applicable. <input type="checkbox"/> Review preliminary fire safety report. <input type="checkbox"/> Review applicable authority codes and standards. <input type="checkbox"/> Establish contacts with utility companies. <input type="checkbox"/> Total load estimates (W/m²). <input type="checkbox"/> Main supply methodology. <input type="checkbox"/> Standby power requirements. <input type="checkbox"/> Main plant space requirements. <input type="checkbox"/> Emergency lighting concept. <input type="checkbox"/> Earthing. <input type="checkbox"/> Review concepts for significant and unusual health and safety risks relevant to the design. <input type="checkbox"/> 	Drawings: <ul style="list-style-type: none"> Sketch drawings (may comprise 'marked-up' architectural drawings) including preliminary plant room requirements and services routes. <input type="checkbox"/> Specifications: <ul style="list-style-type: none"> Nil. Reports: <ul style="list-style-type: none"> Concept services brief - to establish available system concepts and a broad report investigating available options and recommendations, and definition of system requirements and key assumptions. <input type="checkbox"/> Design standards to be used. <input type="checkbox"/> 	<ol style="list-style-type: none"> To ascertain client brief and to review/consider applicable options. Agree roles and responsibilities. Concept and preliminary design phases are often combined on smaller projects. Tendering at this stage unlikely to result in 'like for like' bids. No co-ordination completed at this stage. Costing only on per m² basis.

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Preliminary Design Phase

Design Process	Deliverables	Commentary
Inputs: <ul style="list-style-type: none"> Client approval of concept services design and budgetary implications. <input type="checkbox"/> Updated fire engineering report. <input type="checkbox"/> Power authority requirements/constraints. <input type="checkbox"/> Client approved architectural, structural, and other services concept designs. <input type="checkbox"/> Design time schedule. <input type="checkbox"/> Preliminary service loadings. <input type="checkbox"/> Design: <ul style="list-style-type: none"> Assess supply utility requirements and liaise with local authorities. <input type="checkbox"/> Initial sizing of major plant (transformers, generators, and main switchboards). <input type="checkbox"/> Load estimates based on major plant requirements plus W/m² for general areas. <input type="checkbox"/> Identification of major service routes. <input type="checkbox"/> Location and capacity of main load centres. <input type="checkbox"/> General area lighting layouts. <input type="checkbox"/> General area power distribution methodology (use of perimeter trunking etc.). <input type="checkbox"/> Develop services route requirements, both horizontal and vertical and space co-ordination with other trades. <input type="checkbox"/> Define interface requirements with other services. <input type="checkbox"/> Identification of specific earthing and surge protection requirements. <input type="checkbox"/> Review preliminary design for significant and unusual health and safety risks the design may present during construction and maintenance. <input type="checkbox"/> 	Drawings: <ul style="list-style-type: none"> Single line diagram showing major plant and major distribution (breakers/cables unsized). <input type="checkbox"/> Layout drawings indicating plant room locations, risers and primary service routes. <input type="checkbox"/> Typical area lighting (reflected ceiling plan) and power layouts or schedules. <input type="checkbox"/> Specifications: <ul style="list-style-type: none"> Outline specifications. <input type="checkbox"/> Preliminary equipment schedules for major plant. <input type="checkbox"/> Generic lighting/appliance types. <input type="checkbox"/> Reports: <ul style="list-style-type: none"> Design features (options) report (with agreed option to take to developed design). <input type="checkbox"/> Preliminary electrical equipment heat loads. <input type="checkbox"/> Energy efficiency analysis. <input type="checkbox"/> Lightning protecting assessment. <input type="checkbox"/> Preliminary building services interface matrix. <input type="checkbox"/> Highlight 'significant and unusual' buildability and health and safety issues. <input type="checkbox"/> 	<ol style="list-style-type: none"> Cost estimates at this stage generally cannot be on a full elemental basis, as final distribution is not well defined. Systems could be priced by vendors at this stage but unlikely to get 'like for like' comparison.

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Developed Design Phase

Design Process	Deliverables	Commentary
Inputs: <ul style="list-style-type: none"> Client approval of preliminary design and budgetary implications. <input type="checkbox"/> Client approved architectural, structural, and other services preliminary designs. <input type="checkbox"/> Service loads. <input type="checkbox"/> Defined escape routes with locations for emergency signage. <input type="checkbox"/> Design: <ul style="list-style-type: none"> Elemental load assessments (including documentation of constraints). <input type="checkbox"/> Fault level calculations. <input type="checkbox"/> Lighting calculations and layouts. <input type="checkbox"/> Determine number of power outlets on area by area basis. <input type="checkbox"/> Control methodologies. <input type="checkbox"/> Finalise earthing requirements. <input type="checkbox"/> Major plant and services routes, including access for installation and maintenance, co-ordinated with architecture, structure and other trades. <input type="checkbox"/> Develop and expand the services concepts, selection of typical plant, review of plant room sizes and services space requirements including sizing of mains, sub-mains and protection. <input type="checkbox"/> Assessment of specific treatment harmonics (internally and externally generated). <input type="checkbox"/> Identify utility connections. <input type="checkbox"/> Verify significant and unusual health and safety issues have been addressed in the design. <input type="checkbox"/> 	Drawings: <ul style="list-style-type: none"> Single line diagram showing connections to all equipment and boards (breakers and cables sized). <input type="checkbox"/> Layout drawings indicating plant room locations, risers and service routes and main cable trays. <input type="checkbox"/> Lighting and power layouts. <input type="checkbox"/> Reflected ceiling plans with preliminary co-ordination. <input type="checkbox"/> Specifications: <ul style="list-style-type: none"> Preliminary technical specifications. <input type="checkbox"/> Equipment schedules. <input type="checkbox"/> Reports: <ul style="list-style-type: none"> Updated design features (options) report, including options selected. <input type="checkbox"/> Supply authority approval submissions. <input type="checkbox"/> Updated energy efficiency review. <input type="checkbox"/> Building services interface matrix. <input type="checkbox"/> Highlight 'significant and unusual' buildability and health and safety issues. <input type="checkbox"/> 	<ol style="list-style-type: none"> Cost estimates at this stage can be produced by quantity surveyor on elemental basis, with secondary elements estimated on typical details. Developed design generally provides the minimum level of documentation to clearly define the scope of all electrical elements.

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Detailed Design Phase

Design Process	Deliverables	Commentary
Inputs: <ul style="list-style-type: none"> Client approval of developed design and budgetary implications. <input type="checkbox"/> Client approved architectural, structural, and other services developed designs. <input type="checkbox"/> Design: <ul style="list-style-type: none"> Detailed load assessment. <input type="checkbox"/> Equipment sizing and generic selection. <input type="checkbox"/> Supplies to ancillary systems (public phones, fire alarm panels, etc.). <input type="checkbox"/> Sub circuit cable sizing and breaker selection discrimination checks. <input type="checkbox"/> Co-ordination in principle with structure, architecture and other building services. <input type="checkbox"/> Design of harmonic treatment. <input type="checkbox"/> Finalise utility supplies. <input type="checkbox"/> Highlight significant and unusual health and safety risks that were identified through the design process. <input type="checkbox"/> 	Drawings: <ul style="list-style-type: none"> Single line diagram showing connections to all equipment and boards (breakers and cables sized). <input type="checkbox"/> Layout drawings indicating plant room locations, risers and service routes and main cable tray routes. <input type="checkbox"/> Plant room and riser outline layouts. <input type="checkbox"/> Lighting and power layouts including switching and circuiting. <input type="checkbox"/> Lighting control zoning and specification. <input type="checkbox"/> Distribution schedules with final circuit breakers and cables sized. <input type="checkbox"/> Specifications: <ul style="list-style-type: none"> Detailed technical specifications. <input type="checkbox"/> Detailed equipment schedules. <input type="checkbox"/> Luminaire and fitting schedules. <input type="checkbox"/> Reports: <ul style="list-style-type: none"> Nil 	<ol style="list-style-type: none"> Detailed design generally provides a level of documentation to clearly define the design of all electrical elements. Design details should be co-ordinated with other disciplines. However, the documents produced in this phase may not directly be able to be 'built' from. Co-ordination. In ceiling zones identified with appropriate clearance from structure and other services. Major penetrations identified. Detailed co-ordination of critical areas. Define in the specification the significant and unusual health and safety risks that were identified in the design.

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Construction Design Phase

Design Process	Deliverables	Commentary
Inputs: <ul style="list-style-type: none"> For construction design phase, drawings for architectural, structural, and other services. <input type="checkbox"/> Construction time schedule. <input type="checkbox"/> Design <ul style="list-style-type: none"> Production of larger scale detailed shop drawings including seismic details. <input type="checkbox"/> Co-ordination of all services, structure and architecture. <input type="checkbox"/> Equipment selection and technical submissions. <input type="checkbox"/> Confirmation of capacities, sizes based on equipment selection of all trades. <input type="checkbox"/> Seismic bracing. <input type="checkbox"/> Detailed tray routes and supports. <input type="checkbox"/> Control system programming. <input type="checkbox"/> Detailed layouts of plant rooms and risers. <input type="checkbox"/> Provisions for access and maintenance. <input type="checkbox"/> 	Drawings: <ul style="list-style-type: none"> Revise detailed design documentation to incorporate buildability changes suggested by contractor if they impact on the design intent. <input type="checkbox"/> Equipment submissions as defined in detailed design. <input type="checkbox"/> Fabrication drawings for switchboards and panels. <input type="checkbox"/> Equipment plinth details, mounting and isolation detailing. <input type="checkbox"/> Detailed layouts of plant rooms. <input type="checkbox"/> Detailing of all tray routes and catenary grids including support/hanger details. <input type="checkbox"/> Conduit routing and installation details. <input type="checkbox"/> Seismic bracing details. <input type="checkbox"/> Wiring diagrams and points schedules for control systems. <input type="checkbox"/> Compliance certificates. <input type="checkbox"/> Review: <ul style="list-style-type: none"> Review shop/fabrication and layout drawings for compliance with design. <input type="checkbox"/> Review equipment submission. <input type="checkbox"/> 	<ol style="list-style-type: none"> Normally prepared by the services sub-contractor to enable fabrication of the services design. Deliverables contain sufficient details for elements to be manufactured/constructed without reference to other documents, ie 'the details have co-ordinated the relevant design information across all disciplines and can be built from'. Equipment ordered. At completion of design as built drawings, manuals and equipment details produced to indicate final installed systems. The contractor is responsible for managing health and safety risks during the construction phase.